❖ G-4 NEWS ❖

Volume 3 Issue 1 ***The** Newsletter for Oxygen Compatibility Practitioners* Spring 1996

First Industry-Sponsored Program Set to Launch

A first proposal to industry to sponsor G-4 led programs will be mailed shortly: however, preliminary commitments are adequate to ensure the basic first program *will* be launched. Indications are good that adequate contributions will be received to enable its completion.

It should begin this summer at NASA White Sands Test Facility. The program will seek data to identify the pressure at which thick-section stainless steel may be safely used outside the limits presently recommended in CGA Pamphlet G-4.4.

ASTM approval for the solicitation is being sought and the proposal could be mailed in May. **G4N**

Progress at Orlando: *.....A Little Pinched for Time!*

Blossoming of the Seminar Series and the completion of G-4's first proposal to industry crowded the Committee. However, actions were taken on eight ballots. Two standards were reapproved, the cleaning standard was finished, appendices were added to two standards, and a new calculation screen for G4Math was approved. A new incident study standard will be altered in the wake of persuasive negative votes, and a standard for cleanliness measurement will be converted from a practice to a test method.

The ***G-4 Main*** Committee's new executive officers took charge. New Chairs were designated for several committees: Harold Beeson assumes leadership on Terminology, Michael Yentzen on Education, and Steve Bonafazi on Editorial. Along with routine efforts, the Main Committee met up close and personal with SAE Committee A-10.

The ***G4.01 Test Methods*** Subcommittee reapproved G 72 on Autogenous Ignition Tests and G 74 on Gaseous Impact tests.

Round robin tests for G 122 (on Cleaning Effectiveness), and G 72 remain elusive.

G-4 balloted the Committee's initiative to assume jurisdiction over D 2512, but Committee F-7 balked at the change, and the Committee was returned to square one. The Committee may have to either adopt its own version under a new number or relent in this effort.

The ***G4.02 Practice's*** first Task Force on industry-sponsored programs completed a proposal for testing of thick-section stainless steel and has confirmed sufficient donations to begin. This spring the remainder of the needed funds will be solicited. Other Task Forces are being assembled for additional projects.

The Subcommittee finally reconciled two final Main Committee ballots which dealt with differing portions of G 93. A new and expanded G 93 will publish this year. A new ballot cycle may begin immediately.

Two standards that involve use of ultrasonics to clean and analyze cleanliness (G 131, G 136) were balloted to include a common appendix on the selection of ultrasonic apparatus. Both passed.

A second ballot finished on a new standard for nonvolatile residue analysis by high temperature combustion and drew persuasive negative ballots. It will require a rework. It is being transferred to G4.01 as a test method.

A draft standard on techniques and analysis that have been useful in studying causes of oxygen incidents received two persuasive negative votes and several comments in subcommittee ballot. It will be modified and balloted at both the subcommittee and main Committee levels for the Fall meeting.

The ***G4.05 Education*** subcommittee hosted six papers as part of its Seminar Series (See ***Seminar*** article, page 2). The papers will be published with the papers of the next symposium in 1997. A generous number of papers (perhaps 6-10) are already planned for the Seattle meeting.

A new algorithm for designing distance/volume pieces used with flex hoses passed ballot and will be available on the Committee's World Wide Web site on or before June 1 as a part of the utility **G4Math.EXE** (see ***G-4 Utilities*** article on Page 2).

A Technical and Professional Training (TPT) course held in conjunction with the meetings contained 12 students.

The Advanced TPT Course Task Force is progressing slowly. At this session, Joel Stoltzfus was asked to provide several NASA hazard reviews for potential use as course material. The examples will

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Inside This Issue

Seminar

At this Spring '96 meeting, six papers were offered. Five of these papers will be peer reviewed and included in the Special Technical Publications (STPs) that publish after each G-4 symposium. One (Quiat) may be similarly reviewed after the Fall 1996 meeting. Since two to three years will pass until some of these papers are published, authors will be allowed to provide limited copies after peer review to others upon their moral obligation to purchase the STP when it becomes available. Abstracts for these papers are:

"Configurational Effects on the Combustion of Several Alloy Systems in Oxygen-Enriched Atmospheres" by Dwight Janoff and Michael D. Pedley

ABSTRACT: The promoted combustion resistance of many metals and alloys have been evaluated using 3-mm (0.13-in.) diameter rods. Although the rod configuration has been useful in ranking alloys for combustion resistance, the threshold pressures determined are usually not directly applicable to configurations used in the actual design and fabrication of oxygen systems. This is especially true for configurations that have a higher surface area to volume ratio than 3-mm diameter rods. Investigators have tested alloys for promoted combustion resistance in higher surface area to volume ratios and various configurations, such as small diameter wires, sheet wire mesh, sintered filters, structured packings, tubing, and in the current investigation, metallic sponge. The effects of these various configurations on the promoted combustion resistance of several alloy systems will be reviewed. Alloy systems that will be reviewed are copper alloys, nickel alloys, stainless steels, and aluminum alloys.

"Failure of PTFE Lined Stainless Steel Flexible Pigtail Hose in Oxygen Service" by Rago, J. R., Air Products and Chemicals, Inc., 7201 Hamilton Blvd., Allentown, AP, 18195-1501.

ABSTRACT: Polymer lined flexible hoses can be vulnerable in high-pressure oxygen systems. Ignition within a hose occurred after pressurization. The hose was not protected with a distance piece. However, a key factor appears to have been the presence of contaminants of hydrocarbons. The trail of contaminants leading from the ignition point and following the path of flow is shown in the analysis of this failure.

"Failure of Stainless Steel Check Valve in O_2 Service, " by Rago, J. R., address above.

ABSTRACT: Past fires in check valves in oxygen service have yielded clear internal damage. In a recent failure, most of the valve internals, including polymers, were undamaged and evidence of fire was confined to an O-ring and groove that was downstream of threads. An apparent key causal factor was evidence of silicone grease present.

Characterization of Polymers Found in an Oxygen Environment," by Martha Kay Williams, NASA Kennedy SFC, FL, 32899.

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be studied by the Advanced TPT Task Force.

The Committee's computer utility containing a bibliography of references of interest to oxygen compatibility practitioners was expanded. On the basis that all the papers cited at our symposia are pertinent, the file includes references cited in our Special Technical Publications. At present all citations in STPs 812, 910, 986, 1040, and 1267 have been included, increasing the reference list from 238 entries to more than 700. This file is now designated as Version 1.1 (**G4REF11.DOC**). It will be available for downloading from the Committee's Web Site on or before June 1 (See ***G-4 Utilities*** article on page 2). The next revision will seek to include the citations in STPs 1111 and 1197 and other materials, as well. **G4N**

G-4 Web Site

G-4's Home Page on the World Wide Web now allows the transfer of files. Therefore, anyone can update their G-4 utilities at their convenience as indicated in the article below. In addition, Dwight Janoff, our "WebMaster" has included a searchable data base of NASA data. And finally, a new pamphlet "Why Study Oxygen Compatibility?" patterned after the chapter of the same name in the TPT oxygen safety text book is available. This latter file is very graphical and includes numerous incident photos. Take a look!

Shortly, Dwight will be adding the Call for Papers for G-4's next symposium and will begin updating the existing utilities. **G4N**

G-4 Utilities "Grow"

Two of G-4's computer utilities files have increased in size. The **G-4MATH.EXE** computation program has a new screen for calculating the sizes of Distance/Volume piece used with polymer-lined flex hoses. The screen uses two potential design equations published in a recent paper by Santay et al. (see ***G-4News***, Fall 95) that will be published in the next G-4 STP. G-4 finds both of these approaches may have merit in some circumstance, but it is the user's responsibility to decide whether either approach is appropriate for any specific instance.

The G-4 utility file **G4Ref10.DOC** is now **G-4Ref11.DOC**. The original 1.0 version listed 238 bibliographic references in a MSWord file suitable for searching or for copying and pasting into the reference list of papers for G-4's seminars and symposia. Version 1.0 included all of the papers in the first seven volumes of the G-4 STP Series plus about 100 additional commonly cited references. The expanded file adds the papers in the seventh volume (STP 1267) plus *all* of the references cited in *every* paper in five of G-4's STP volumes, bringing the number of titles to about 700.

Both upgrades may be downloaded on or before June 1 from the G-4 home page on the World Wide Web at HTTP://L12ID.NASA.JSC.GOV. **G4N**

The "NFPA." What's that?

The National Fire Protection Association (NFPA) is a voluntary standards-producing organization. Anyone can submit a request for a new fire safety standards project. If the Standards Council approves the project, it either assigns the project to an existing Technical Committee or establishes a new Technical Committee whose membership reflects a fair balance of concerned interests. All NFPA standards are developed and periodically revised by these Technical Committees. Members of the Committees are appointed by the Standards Council and include volunteer experts representing the government, educational institutions, business, insurance companies, industry, and consumers. Some 5,100 persons serve on the approximately 200 Technical Committees in the NFPA system.

The Committees meet to consider all proposals received and finalize the drafts of any proposed documents. Letter ballot by at least two-thirds of all Committee members eligible to vote is required for Committee approval. All proposals, together with the Committee action on each proposal appear in the NFPA's Report on Proposals (ROP). The ROP is widely circulated and is available to anyone on request. A sixty-day comment period is provided for all proposals in the ROPs. The Committee report is presented for open debate at NFPA's semiannual meeting in May or November. Anyone, regardless of membership in NFPA, may present views at these meetings. Subsequently, the NFPA membership votes to approve, amend, and/or return a portion of the entire report to the Committee. The final step is the issuance of the document by the Standards Council with an ANSI or NFPA American National Standard number.

The NFPA has three classes of documents: a Guide, a Standard, and a Code. A Guide provides useful information, and is optional in applicability. A Standard or Code is a document that may be strictly enforced, become a regulation or may become public law. Some of the NFPA documents useful to G-4 include: NFPA 50—Bulk Oxygen Systems at Consumer Sites, NFPA 51—Welding and Cutting and Allied Processes, Oxygen-Fuel Gas Systems for, and NFPA 53—Fire Hazards in Oxygen-Enriched Atmospheres.

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(***Seminar*** *from page 2)*

ABSTRACT: At Kennedy Space Center, the characterization of polymers is accomplished by the Materials Science Laboratory. Infrared Analysis (IRS) is the technique used to identify molecular structure, and along with chemical or electronic separation techniques, additives or contaminants can be identified. Other techniques such as thermal analysis (TGA) can be used to identify transitional changes and suggest similar versus different chemical compositions, while X-ray Photoelectron Microscopy (XPS) can identify surface composition or degradation and elemental ratios. Gas Chromatography/mass spectrometry address outgassing properties and their effect on the oxygen environment.

This paper will address the forensics of polymer identification using such combination techniques as IRS and TGA, and highlight other techniques utilized in this challenging effort.

An Overview of Fatigue and Metallurgical Failure Modes and Analysis at the Kennedy Space Center," by Steve McDanels, NASA Kennedy SFC, FL, 32899.

ABSTRACT: NASA's Kennedy Space Center (KSC) utilizes a wide variety of materials in many different applications. A partial list of these materials include many different series of carbon steel, stainless steel, and aluminum. The failure modes encountered include stress corrosion cracking (SCC), hydrogen assisted cracking (HAC), overload, and fatigue. Failure analysis exemplifying these materials, applications, and modes are routinely performed using stereomicroscopy, scanning electron microscope fractography, and metallography. The analyses were performed on both NASA and Air Force flight hardware components, as well as, components from the external tank (ET), the solid rocket boosters (SRBs), and Ground support equipment (GSE).

"The Potential Use of Inconel 625 and Monel Weld Overlay in Oxygen Service," Leonard Quiat, Air Liquide P&C, 2700 Post Oak Blvd., Houston, TX, 77056-5705.

ABSTRACT: Compressed Gas Association and ASTM Committee G-4 recommend the use of copper-nickel alloys in impingement areas of oxygen systems. Evidence has shown that these alloys tend to prevent ignition or fire propagation when particles impinge on copper-nickel surface. Since the use of alloy materials can be extensive in gas oxygen systems and copper-nickel impingement plates can be difficult to install, it may be feasible to use an interior surface overlay. The overlay would allow the use of a carbon steel foundation with a Monel or Inconel surface for particles to impinge upon. Current technology can ensure that the entire surface of the carbon steel can be covered, and that no carbon steel is exposed to the oxygen stream. The advantages to this method would be reduced costs in materials, and the ability to use lighter schedule pipe in some applications (since carbon steel has a higher yield strength than copper-nickel alloys). The disadvantages may include availability of experienced fabricators and manufacturing equipment, the lack of oxygen compatibility testing of this material and welding of this material after it has been fabricated. **G4N**

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Your name will be listed in our publicly available database of oxygen compatibility enthusiasts, please check ***all*** boxes that apply to you.

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G-4 NEWS

Non-Profit Org.

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G-4 Events and Housekeeping

Regular meetings of the Committee G-4 have been scheduled as follows:
Nov 13-14, 1996 .....Seattle, WA
Mar 18-20, 1997.....St. Louis, MO
Nov 11-12, 1997.....San Diego, CA-
Contact Steve Mawn (610) 832-9726 for details or membership data. ASTM Membership is $65 per year.

The next G-4 Symposium is on:
Nov 13-14, 1997.....San Diego, CA
For a Call for Papers or Program, call Steve Mawn (610) 832-9726.

Public offerings of the course: *Controlling Fire Hazards in Oxygen Handling Systems are* on:
Nov 11-12, 1996 .....Seattle, WA
Mar 17-18, 1997.....St. Louis, MO

Contact Scott Murphy (610) 832-9685 for information or brochure. Cost is $675.00 (including text). Can be offered at your site for a negotiated price.

The two-volume course text: *Fire Hazards in Oxygen Systems* may be ordered from Scott Murphy (610) 832-9685 Price is $195.

The G-4 Videotape *Oxygen Safety* PCN 12-700880-31 may be ordered from ASTM Customer Service at (610) 832-9585. Price $75 ($67 for members).

Recent G-4 Standards actions/revisions:
G 131-96 "Cleaning Materials and Component By Ultrasonic...."
G 136-96 "Ultrasonic Extraction of Contaminants....."
G 93-96 " Cleaning Methods (Revision).....".

All G-4 standards appear in part 14.02 of the Book of Standards or may be ordered individually from ASTM Customer Service (610) 832-9585. Typical standard prices range $15-30.

Details:

This newsletter is a product of ASTM Committee G-4. The editorial staff is the G-4 Main- and Sub-Committee Officers and ASTM Staff:

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